PowerMOS transistor | BUK455-60A/B

GENERAL DESCRIPTION

N-channel enhancement mode field-effect power transistor in a plastic envelope.
The device is intended for use in Switched Mode Power Supplies (SMPS), motor control, welding, DC/DC and AC/DC converters, and in automotive and general purpose switching applications.

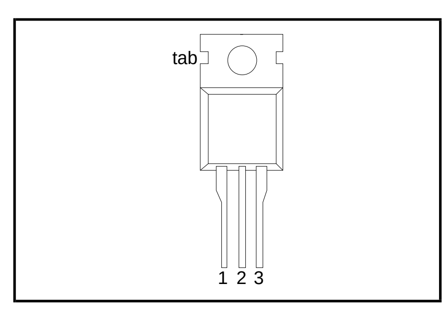
QUICK REFERENCE DATA

SYMBOL	PARAMETER	MAX.	MAX.	UNIT
	BUK455	-60A	-60B	
V_{DS}	Drain-source voltage	60	60	V
I_D	Drain current (DC)	41	38	A
P_{tot}	Total power dissipation	125	125	W
T_j	Junction temperature	175	175	˚C
$R_{DS(ON)}$	Drain-source on-state resistance	0.038	0.045	Ω

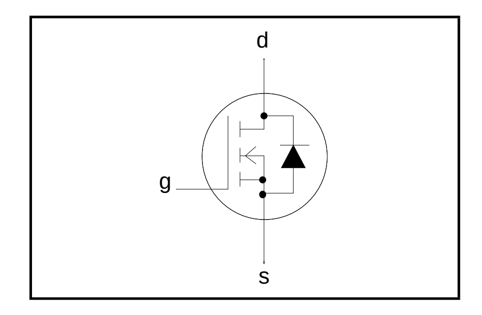
PINNING - TO220AB

PIN	DESCRIPTION
1	gate
2	drain
3	source
tab	drain

PIN CONFIGURATION



SYMBOL



LIMITING VALUES

Limiting values in accordance with the Absolute Maximum System (IEC 134)

SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.	MAX.	UNIT
V_{DS}	Drain-source voltage	-	-	60		V
V_{DGR}	Drain-gate voltage	R_{GS} = 20 kΩ	-	60		V
$\pm V_{GS}$	Gate-source voltage	-	-	30		V
				-60A	-60B	
I_D	Drain current (DC)	T_{mb} = 25 ˚C	-	41	38	A
I_D	Drain current (DC)	T_{mb} = 100 ˚C	-	29	27	A
I_{DM}	Drain current (pulse peak value)	T_{mb} = 25 ˚C	-	164	152	A
P_{tot}	Total power dissipation	T_{mb} = 25 ˚C	-	125		W
T_{stg}	Storage temperature	-	- 55	175		˚C
T_j	Junction Temperature	-	-	175		˚C

THERMAL RESISTANCES

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
$R_{th\ j-mb}$	Thermal resistance junction to mounting base		-	-	1.2	K/W
$R_{th\ j-a}$	Thermal resistance junction to ambient		-	60	-	K/W

STATIC CHARACTERISTICS

T_{mb} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
$V_{(BR)DSS}$	Drain-source breakdown voltage	V_{GS} = 0 V; I_D = 0.25 mA	60	-	-	V
$V_{GS(TO)}$	Gate threshold voltage	V_{DS} = V_{GS}; I_D = 1 mA	2.1	3.0	4.0	V
I_{DSS}	Zero gate voltage drain current	V_{DS} = 60 V; V_{GS} = 0 V; T_j = 25 ˚C	-	1	10	µA
I_{DSS}	Zero gate voltage drain current	V_{DS} = 60 V; V_{GS} = 0 V; T_j =125 ˚C	-	0.1	1.0	mA
I_{GSS}	Gate source leakage current	V_{GS} = ±30 V; V_{DS} = 0 V	-	10	100	nA
$R_{DS(ON)}$	Drain-source on-state resistance	V_{GS} = 10 V; I_D = 20 A **BUK455-60A**	-	0.03	0.038	Ω
		BUK455-60B	-	0.04	0.045	Ω

DYNAMIC CHARACTERISTICS

T_{mb} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
g_{fs}	Forward transconductance	V_{DS} = 25 V; I_D = 20 A	8	13.5	-	S
C_{iss}	Input capacitance	V_{GS} = 0 V; V_{DS} = 25 V; f = 1 MHz	-	1650	2000	pF
C_{oss}	Output capacitance		-	560	750	pF
C_{rss}	Feedback capacitance		-	300	400	pF
$t_{d\ on}$	Turn-on delay time	V_{DD} = 30 V; I_D = 3 A;	-	25	40	ns
t_r	Turn-on rise time	V_{GS} = 10 V; R_{GS} = 50 Ω;	-	60	90	ns
$t_{d\ off}$	Turn-off delay time	R_{gen} = 50 Ω	-	125	160	ns
t_f	Turn-off fall time		-	100	130	ns
L_d	Internal drain inductance	Measured from contact screw on tab to centre of die	-	3.5	-	nH
L_d	Internal drain inductance	Measured from drain lead 6 mm from package to centre of die	-	4.5	-	nH
L_s	Internal source inductance	Measured from source lead 6 mm from package to source bond pad	-	7.5	-	nH

REVERSE DIODE LIMITING VALUES AND CHARACTERISTICS

T_{mb} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
I_{DR}	Continuous reverse drain current	-	-	-	41	A
I_{DRM}	Pulsed reverse drain current	-	-	-	164	A
V_{SD}	Diode forward voltage	I_F = 41 A ; V_{GS} = 0 V	-	1.4	2.0	V
t_{rr}	Reverse recovery time	I_F = 41 A; -dI_F/dt = 100 A/µs;	-	60	-	ns
Q_{rr}	Reverse recovery charge	V_{GS} = 0 V; V_R = 30 V	-	0.30	-	µC

AVALANCHE LIMITING VALUE

T_{mb} = 25 ˚C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
W_{DSS}	Drain-source non-repetitive unclamped inductive turn-off energy	I_D = 41 A ; V_{DD} ≤ 25 V ; V_{GS} = 10 V ; R_{GS} = 50 Ω	-	-	100	mJ

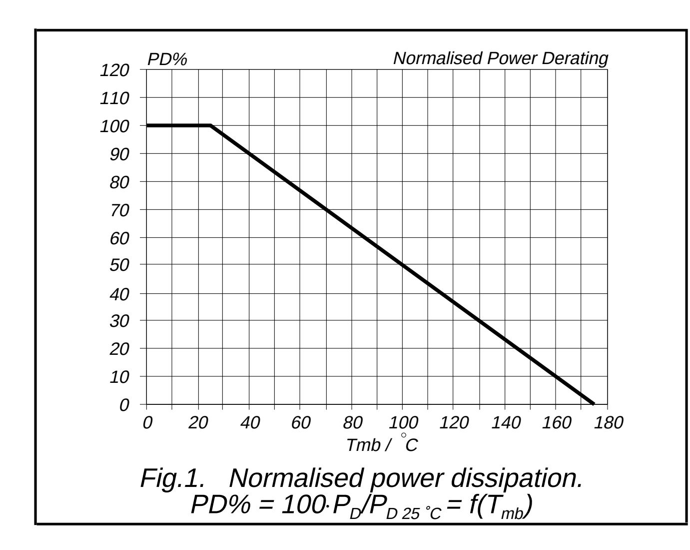


Fig.1. Normalised power dissipation.
$PD\% = 100 \cdot P_D/P_{D\ 25\ ^\circ C} = f(T_{mb})$

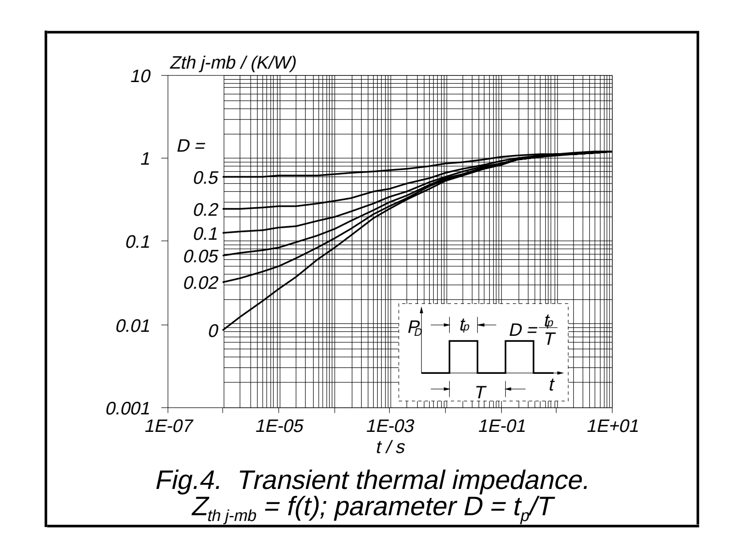


Fig.4. Transient thermal impedance.
$Z_{th\ j\text{-}mb} = f(t)$; parameter $D = t_p/T$

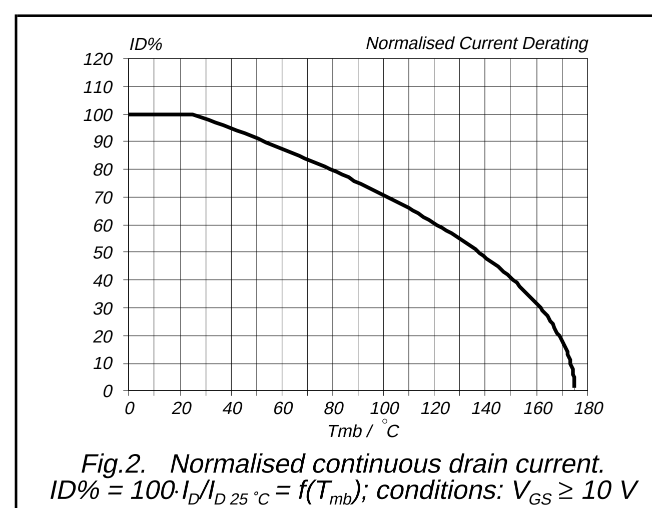


Fig.2. Normalised continuous drain current.
$ID\% = 100 \cdot I_D/I_{D\ 25\ ^\circ C} = f(T_{mb})$; conditions: $V_{GS} \geq 10$ V

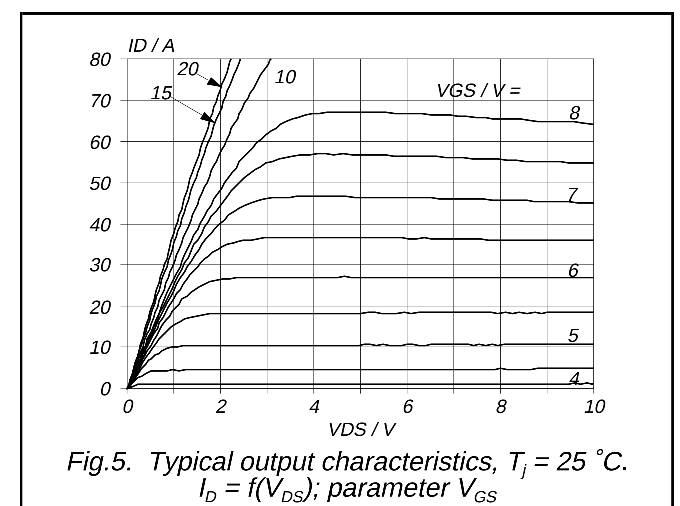


Fig.5. Typical output characteristics, $T_j = 25\ ^\circ C$.
$I_D = f(V_{DS})$; parameter V_{GS}

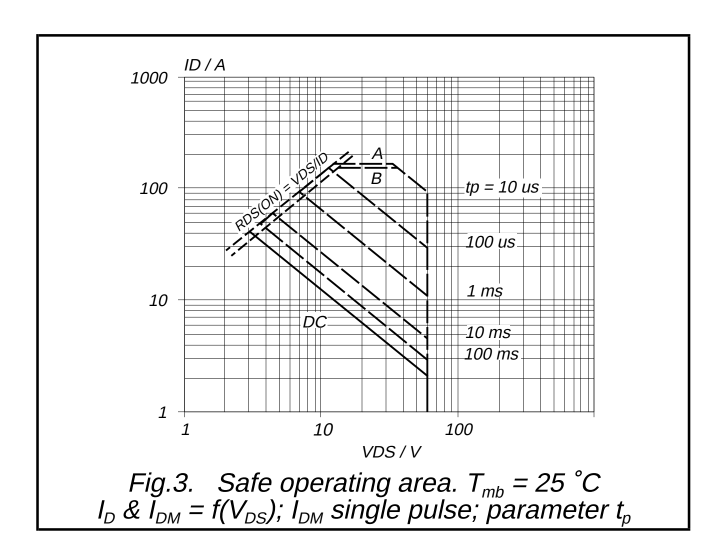


Fig.3. Safe operating area. $T_{mb} = 25\ ^\circ C$
I_D & $I_{DM} = f(V_{DS})$; I_{DM} single pulse; parameter t_p

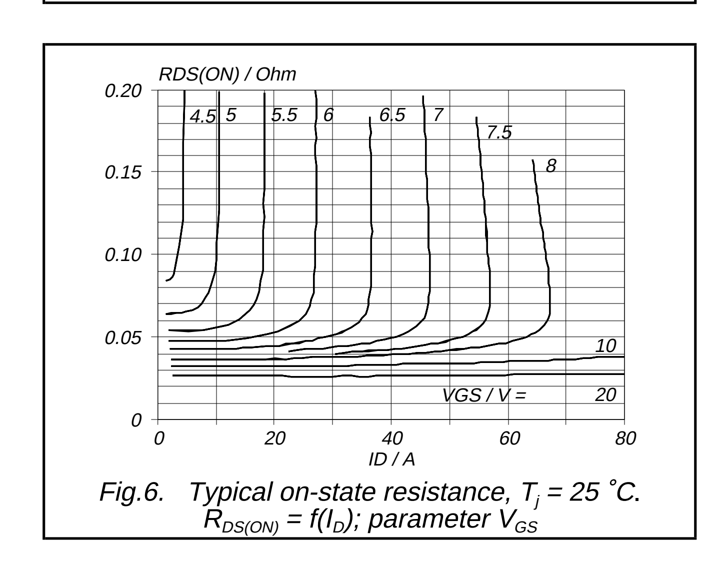


Fig.6. Typical on-state resistance, $T_j = 25\ ^\circ C$.
$R_{DS(ON)} = f(I_D)$; parameter V_{GS}

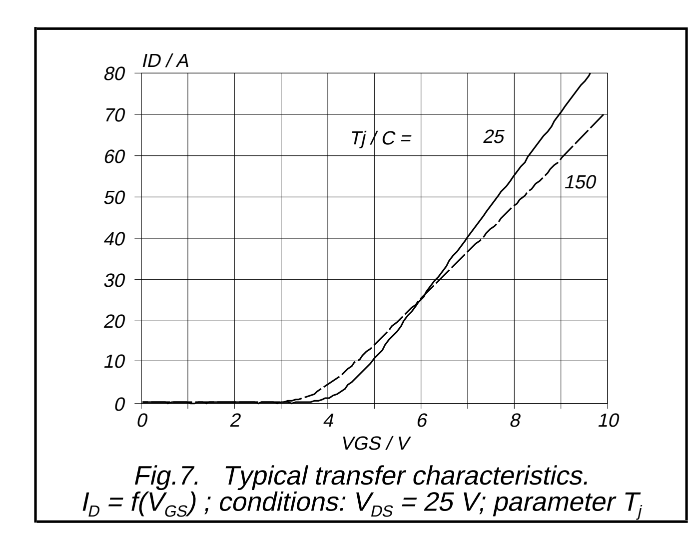


Fig.7. Typical transfer characteristics.
$I_D = f(V_{GS})$; conditions: V_{DS} = 25 V; parameter T_j

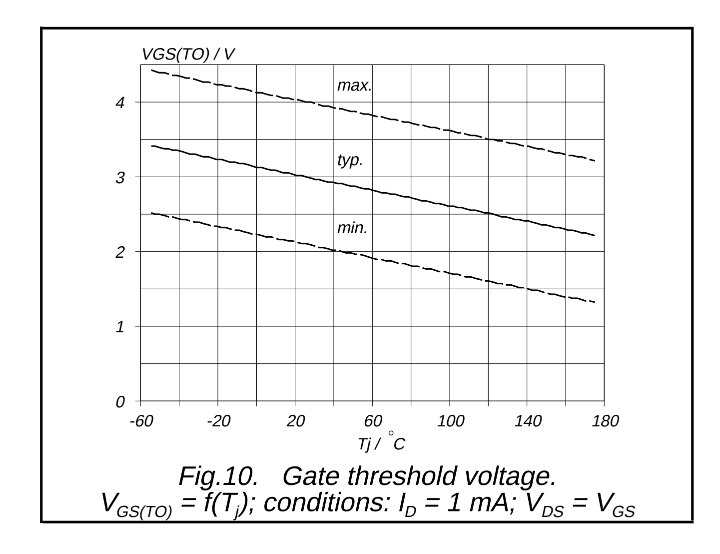


Fig.10. Gate threshold voltage.
$V_{GS(TO)} = f(T_j)$; conditions: I_D = 1 mA; $V_{DS} = V_{GS}$

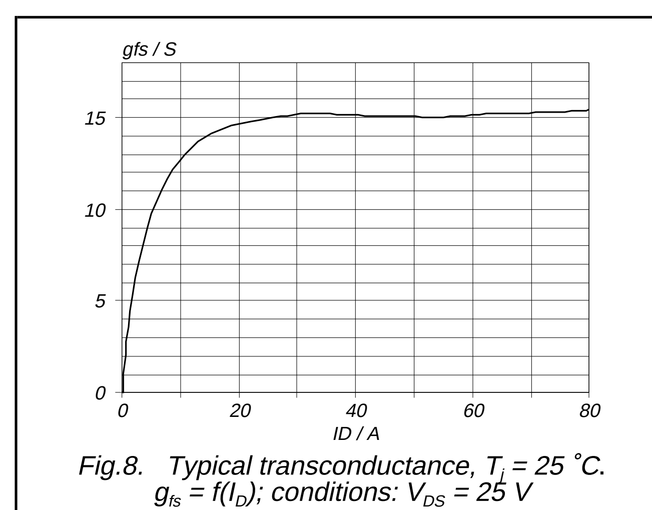


Fig.8. Typical transconductance, T_j = 25 ˚C.
$g_{fs} = f(I_D)$; conditions: V_{DS} = 25 V

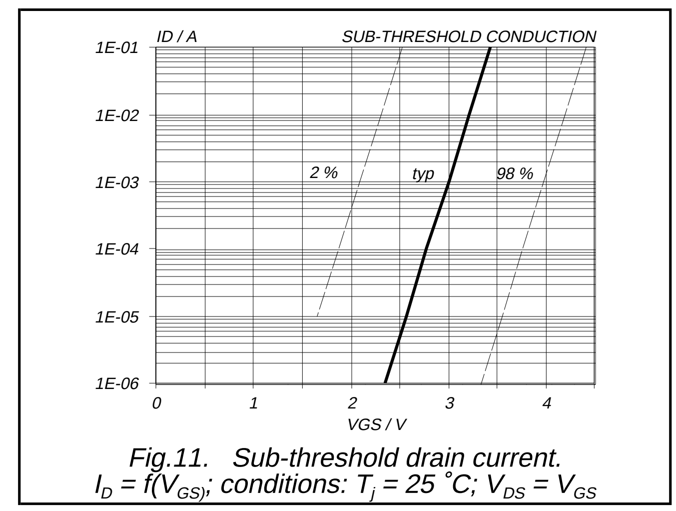


Fig.11. Sub-threshold drain current.
$I_D = f(V_{GS})$; conditions: T_j = 25 ˚C; $V_{DS} = V_{GS}$

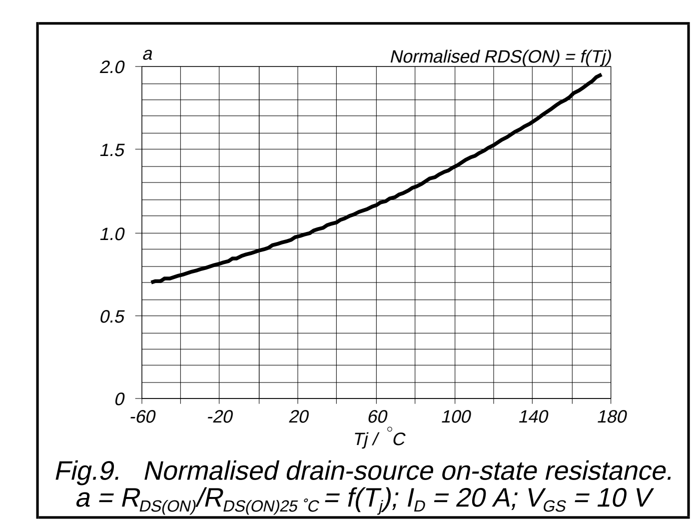


Fig.9. Normalised drain-source on-state resistance.
$a = R_{DS(ON)}/R_{DS(ON)25\,^{\circ}C} = f(T_j)$; I_D = 20 A; V_{GS} = 10 V

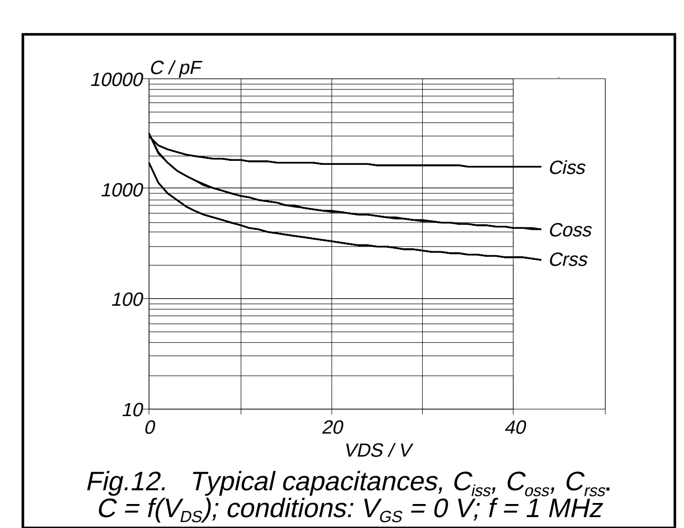


Fig.12. Typical capacitances, C_{iss}, C_{oss}, C_{rss}.
$C = f(V_{DS})$; conditions: V_{GS} = 0 V; f = 1 MHz

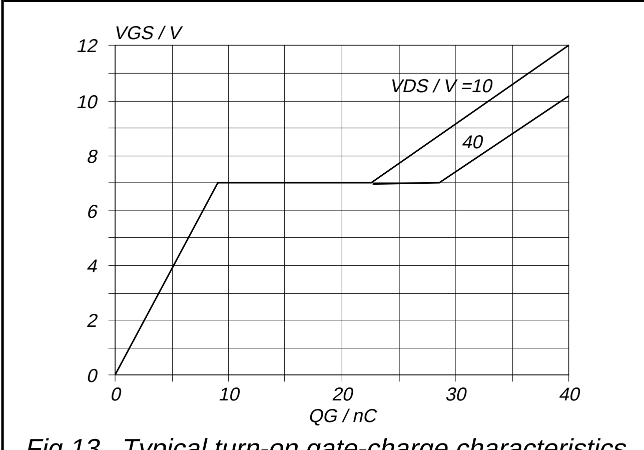


Fig.13. Typical turn-on gate-charge characteristics. $V_{GS} = f(Q_G)$; conditions: I_D = 41 A; parameter V_{DS}

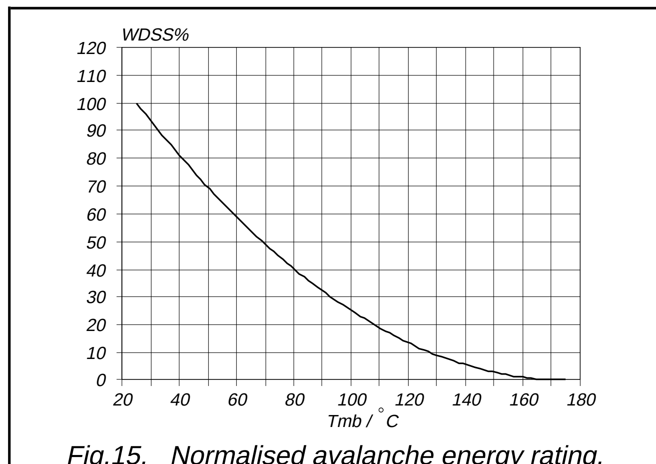


Fig.15. Normalised avalanche energy rating. $W_{DSS}\% = f(T_{mb})$; conditions: I_D = 41 A

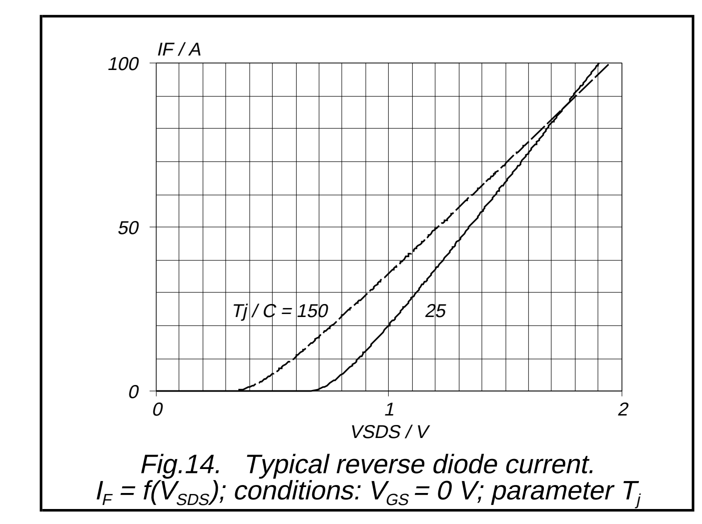


Fig.14. Typical reverse diode current. $I_F = f(V_{SDS})$; conditions: V_{GS} = 0 V; parameter T_j

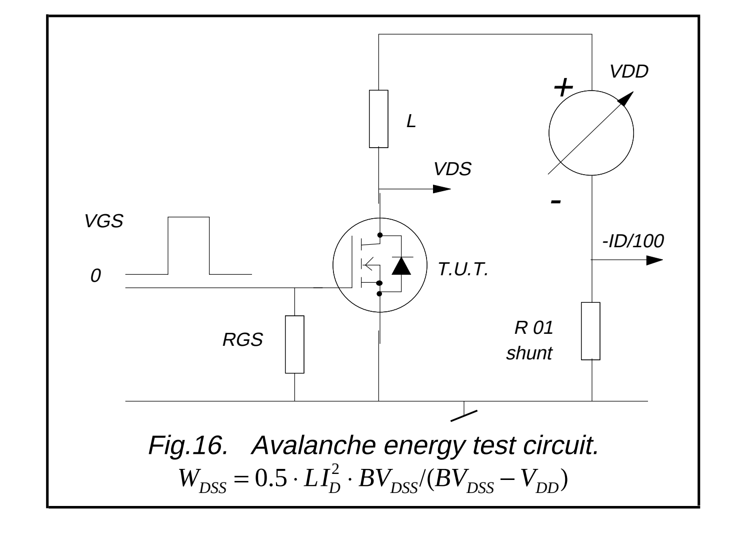


Fig.16. Avalanche energy test circuit.
$$W_{DSS} = 0.5 \cdot LI_D^2 \cdot BV_{DSS}/(BV_{DSS} - V_{DD})$$

MECHANICAL DATA

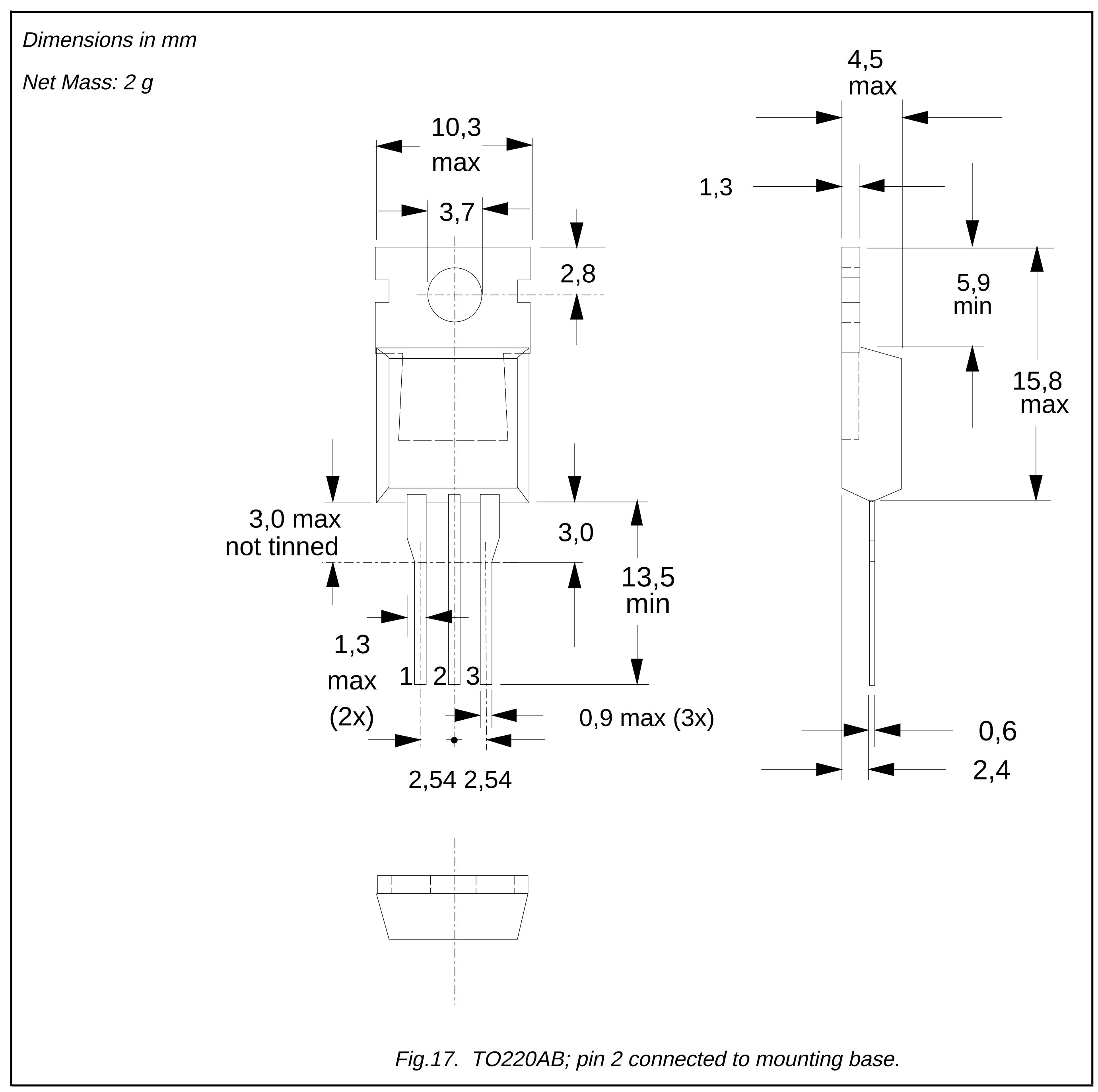


Fig.17. TO220AB; pin 2 connected to mounting base.

Notes

1. Observe the general handling precautions for electrostatic-discharge sensitive devices (ESDs) to prevent damage to MOS gate oxide.
2. Accessories supplied on request: refer to mounting instructions for TO220 envelopes.
3. Epoxy meets UL94 V0 at 1/8".

DEFINITIONS

Data sheet status	
Objective specification	This data sheet contains target or goal specifications for product development.
Preliminary specification	This data sheet contains preliminary data; supplementary data may be published later.
Product specification	This data sheet contains final product specifications.
Limiting values	
Limiting values are given in accordance with the Absolute Maximum Rating System (IEC 134). Stress above one or more of the limiting values may cause permanent damage to the device. These are stress ratings only and operation of the device at these or at any other conditions above those given in the Characteristics sections of this specification is not implied. Exposure to limiting values for extended periods may affect device reliability.	
Application information	
Where application information is given, it is advisory and does not form part of the specification.	
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